EXP-71
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ACCELERATOR EXPERIMENT-- Momentum Transmission of the 200-MeV Line

Experimentalists: The Booster Group

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To gain the maximum benefit of debuncher operation, it is planned to shift the phase of tank 9 back to the nominal design. This means that the linac beam will have a larger momentum spread (±.2%) than the current operation mode (±.1%). Explanation of the reasons for such an operating mode has been stated numerous times. The current question is what additional loss,if any, can be expected in the 200-MeV line when this beam is transported.

Experiment

To obtain a simple answer to this question, the following brief experiment was done: With the linac intensity at a nominal 90 mA, a short tune-up of the line was done to approximate the minimum steering mode in the quadrupoles according to the scheme previously worked out. A plot of the 200-MeV line toroids is taken. The phase of tank 9 is moved to lower the momentum of the beam. Another plot of the line toroids is taken. Line elements are not changed. Thus, loss of beam can be attributed to a deviation of particles from the central momentum of the line. The following table shows two cases - a shift of .18 and a shift of .29 percent.

P	Linac Out mA	S2 In mA	Trans. %	Inj. mA	Trans. %
Nom	92	88	95.7	85	92.4
-.18%	92	87.5	95.1	83	90.2
-.29%	92	87	94.6	82	89.1

The full initial width is approximately .21% with no emittance subtraction. Moving the central momentum over .2% would put the central momentum at the fringe of a beam with a spread of ±.2% and the outer edge at the .3% point (a pessimistic value). The drop in transmission to the toroid at the entrance to S2 is seen to be very small with a slightly larger drop at the injection point into the ring.

Conclusion

Transmission of the ±.2% linac beam should cause minimal added loss.

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